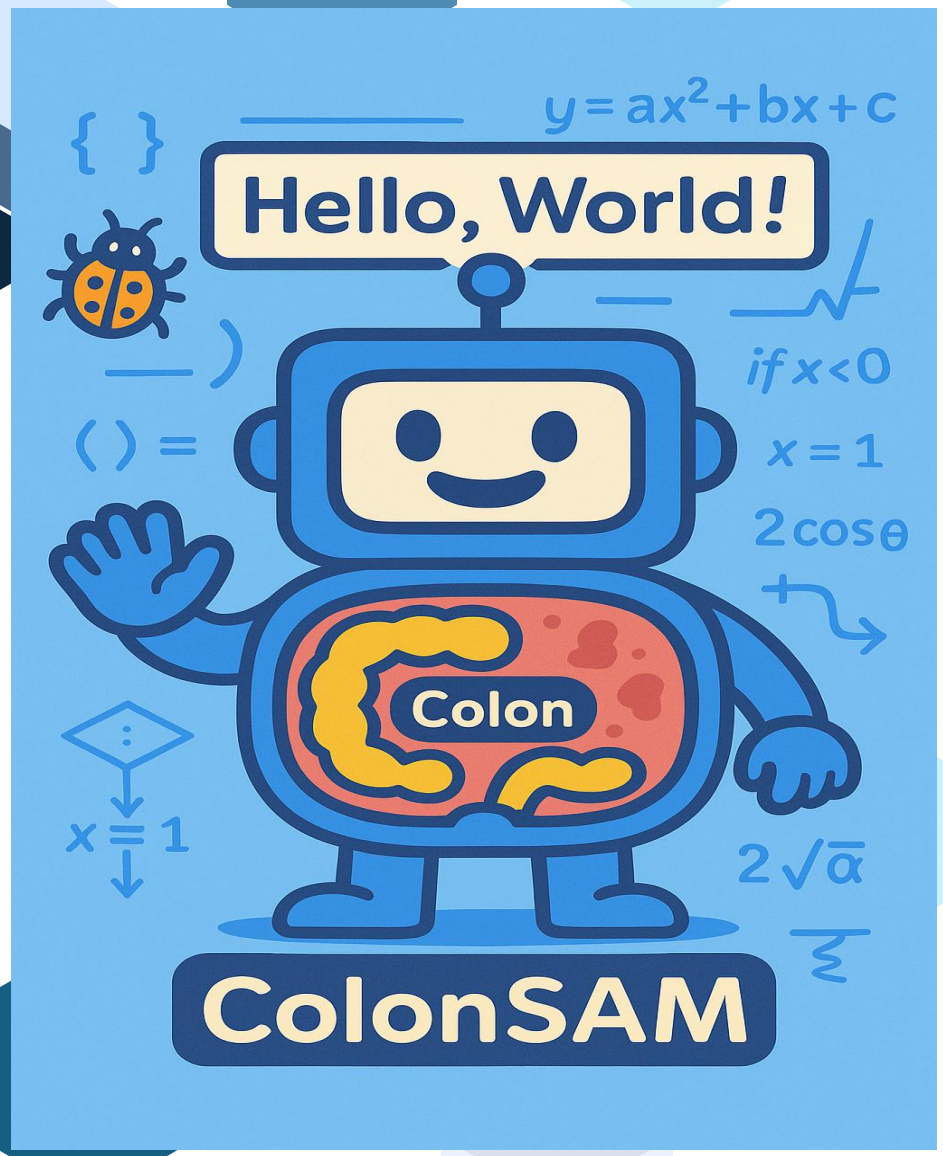
CRCV REU 2025

Week 6

Mentor: Dr. Tian
Student: Syn Nguyen



ColonSAM

Goal:

Develop prompt free model to segment polyps (other organs)

Why:

Colorectal cancer survival rate: 91% (stage I and II), 13% (stage IV)

Contribution:

SOTA, light-weight prompt-free segmentation model

02

Completed



What have been done

- Read 12 papers on prompt-free SAM
- Set up code space: https://github.com/XueyuLiu/PPO
- Debugging and generate initial prompts for SUN-SEG

03

Proposed approach



Approach

Liu, Xueyu, et al. *Plug-and-Play PPO: An Adaptive Point Prompt Optimizer Making SAM Greater*. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2025. arXiv:2404.04280v1.

Reinforcement Learning

- Generate initial mask using DINOv2
- Add bounding box or positive/negative point
- Evaluate new prompt with reward function
- Agent will add/remove/restore

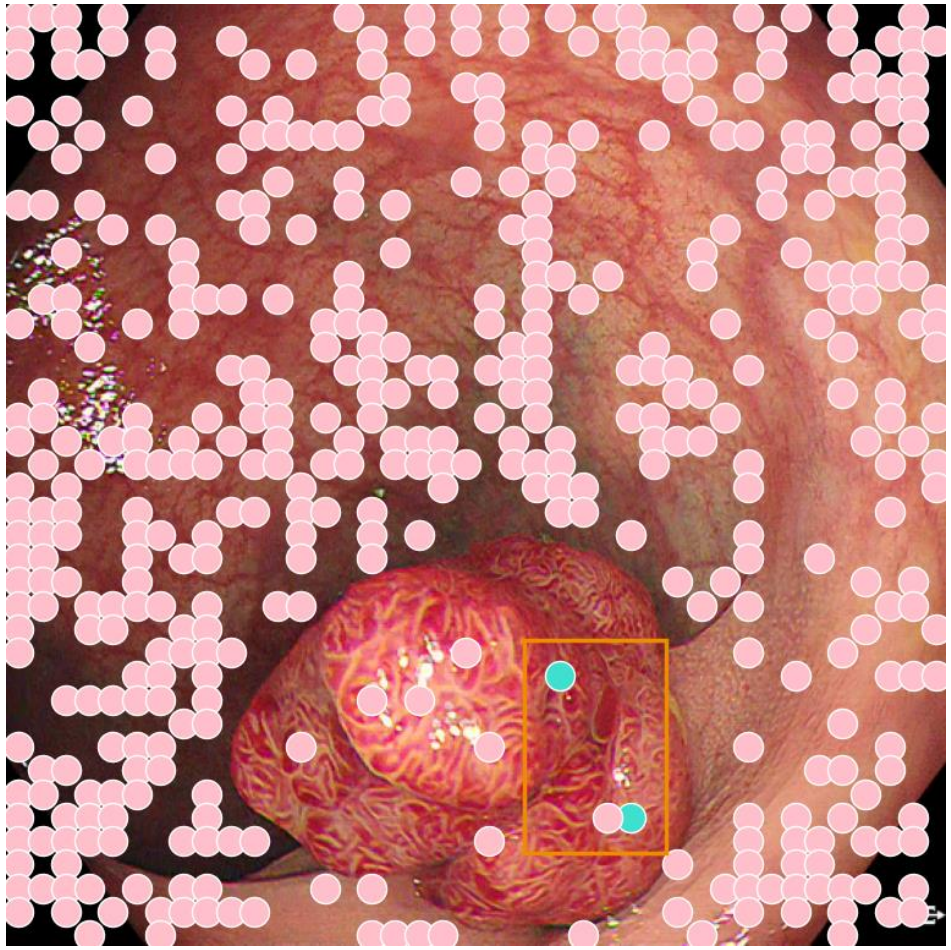
Challenges

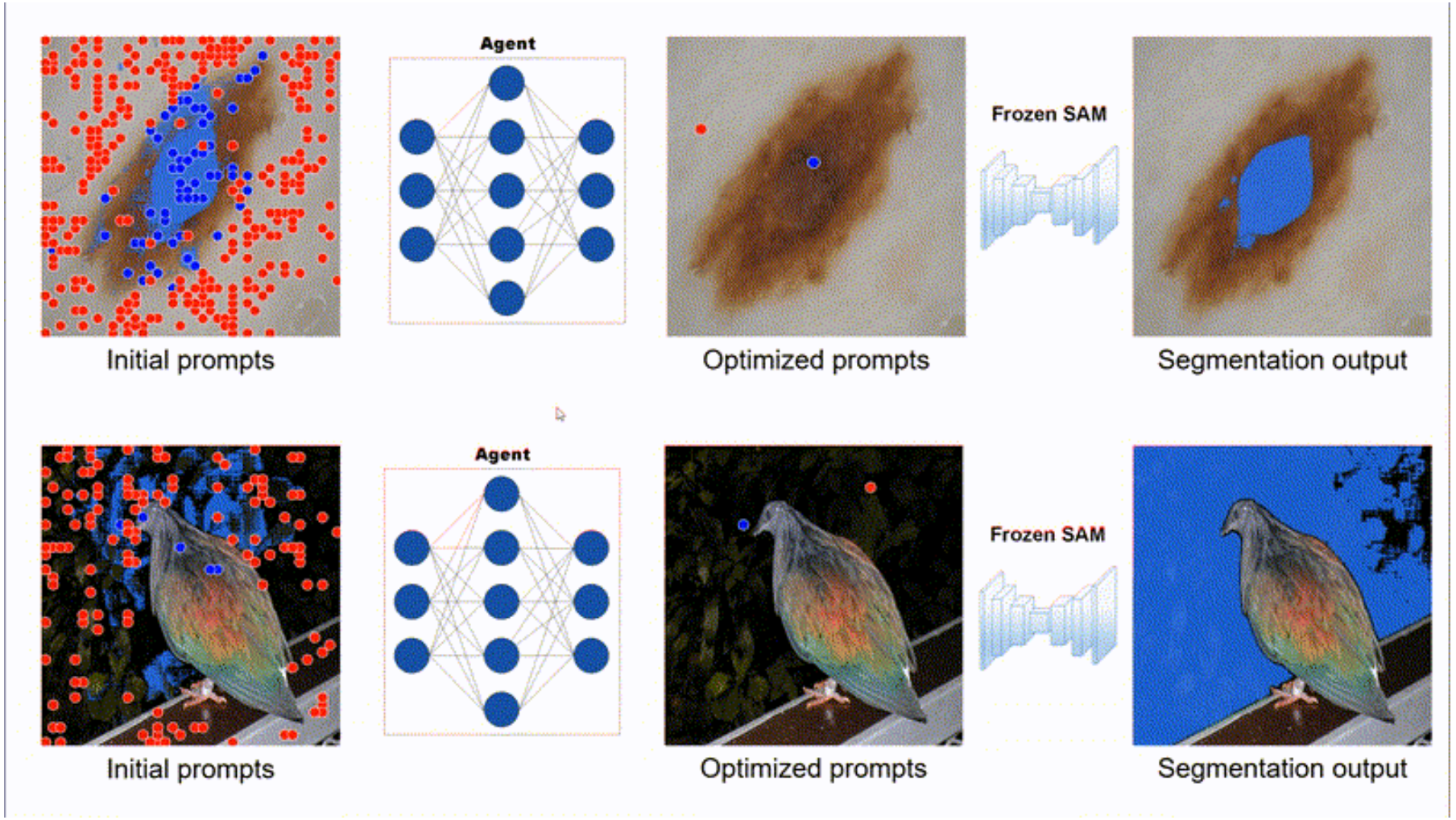
- Adapting to 3D dataset
- Missing code

04

Results






Agent
Frozen SAM
Initial prompts
Optimized prompts
Segmentation output
Agent
Frozen SAM
Initial prompts
Optimized prompts
Segmentation output

Weekly Plan

Week 1-2

☑ Read papers about SAM2, CLIP-SAM, MedSAM2

☑ Inference with MedSAM2

☑ Inference on SUN-SEG

Week 3-4

☑ Fine-tune SAM2

☑ Read papers about universal prompt free segmentation model

Week 5-8

☐ Find a light-weight prompt-free approach

☐ Create a prompt-free model for colon segmentation

References

Kirillov, Alexander, et al. *Segment Anything*. 2023. arXiv, https://arxiv.org/abs/2304.02643.

Ravi, Nikhila, et al. *SAM 2: Segment Anything in Images and Videos*. 2024. arXiv, https://arxiv.org/abs/2408.00714.

Ma, Jun, et al. "Segment Anything in Medical Images." *Nature Communications*, vol. 15, no. 1, Jan. 2024, https://doi.org/10.1038/s41467-024-44824-z.

Zhu, Jiayuan, et al. *Medical SAM 2: Segment Medical Images as Video via Segment Anything Model 2*. 2024. arXiv, https://arxiv.org/abs/2408.00874.

Wang, Haoxiang, et al. *SAM-CLIP: Merging Vision Foundation Models towards Semantic and Spatial Understanding*. 2024. arXiv, https://arxiv.org/abs/2310.15308.

Ji, Ge-Peng, et al. "Video Polyp Segmentation: A Deep Learning Perspective." *Machine Intelligence Research*, vol. 19, no. 6, Nov. 2022, pp. 531–549. Springer Science and Business Media LLC, https://doi.org/10.1007/s11633-022-1371-y.

Chen, Zhen, et al. *UN-SAM: Universal Prompt-Free Segmentation for Generalized Nuclei Images*. 2024. arXiv, https://arxiv.org/abs/2402.16663.

THANK YOU!

